CHAPTER 1
INTRODUCTION

1-1. Purpose

This manual establishes the requirements for an Energy Monitoring and Control System (EMCS), an energy management system which employs minicomputers, microcomputers, associated peripherals, instrumentation, control equipment, and applications programs written in high level computer languages like FORTRAN, or PASCAL. The EMCS is configured as a network with control functions at multiple locations and a central point of operator control and supervision. This system may be used to effect energy and manpower savings for heating, ventilating, and air conditioning, process equipment, lighting, chillers, and boilers. The EMCS may also be used to assist in building and maintenance management.

1-2. Scope

This manual provides a methodology, and standards for the design of an EMCS. It establishes criteria concerning configurations and equipment to be used, system and applications software, typical application flow diagrams and input/output (I/O) summary tables for common mechanical and electrical systems, Data Transmission Media (DTM) hardware and applications, and mechanical and electrical modifications to existing equipment for EMCS implementation. The methodology described will be used for design of each system. The designer will not deviate from the design instructions given in this manual.

1-3. References

Appendix A contains references used in the text; Appendix B contains information pertaining to EMCS field surveys. A bibliography and a glossary of terms pertaining to EMCS follows the appendices.

1-4. State of the art EMCS

The EMCS, depending on its configuration, consists of a Central Control Unit (CCU) with various combinations of peripherals, DTMs, field control and monitoring panels, necessary interfacing controls, and instruments. Smart field panels, each referred to as a Field Interface Device (FID), contain a microcomputer and other supporting electronics. Field I/O functions are performed by a multiplexer (MUX) which is functionally part of the FID, although it may be remotely located. In the non-communicating or "stand-alone" mode, the FID performs certain local control functions and applications programs without requiring communications with the CCU.

1-5. Reliability

The stand-alone operation of the FID ensures that equipment under its control will continue to operate in the absence of communications with the central computer. In the stand-alone mode, each FID will continue to perform functions such as data collection, time scheduled operations, duty cycling, space temperature adjustments, and self-diagnosis. Failure of any FID must not adversely affect performance of the rest of the EMCS except for those programs performed at the central computer requiring data from the failed FID.

1-6. Expandability

The EMCS installed under contracts that provide the Government with technical rights in hardware, software, and job license agreements allows for system expandability. Additional hardware and/or software may be required for incorporating new buildings, control points or other systems into the EMCS. The expansion of systems will be developed with great care.

1-7. Other benefits

Application of state of the art design, such as distributed processing, results in efficient use of the central computer, since many time-consuming operations can take place in the FID. The central computer system utilizes its time performing central alarm reporting, trend logging, electronic demand limiting, and energy optimization functions.

1-8. Other applications

The EMCS may also perform other functions, such as maintenance management, monitoring of water treatment plants/industrial facilities, and other nonenergy related tasks, provided that agency guidelines on funding and applications are satisfied. Where an EMCS is installed in buildings having life safety systems utilizing EMCS controlled devices, coordination of priorities for control of the final device, such as a damper, will be determined and specified.

1-9. Codes and standards

Design of the EMCS will incorporate all applicable codes, standards, and regulations which are in effect for the specific site at the time drawings and specifications are prepared.

1-10. Functional equivalency

This manual defines the minimum needs of the Government. Some manufacturers offer systems in response to the Government's need which vary in system architecture and physical arrangements. It is imperative that the procuring agency deter-mines that the system offered in response to the Government's requirements does, in fact, meet or exceed the specified arrangement. One example of functional equivalency is the concept of identical hot standby "parallel" systems. In this system, one processor is sized to handle the entire task, while the second processor is “on-line” and "idling", prepared to assume all tasks without interruption.

1-11. Standard HVAC control panel

This EMCS manual does not address any changes which may occur by using a standard HVAC control panel utilizing individual single loop controllers. The designer will make appropriate changes to interface with the panel, where used on new projects.